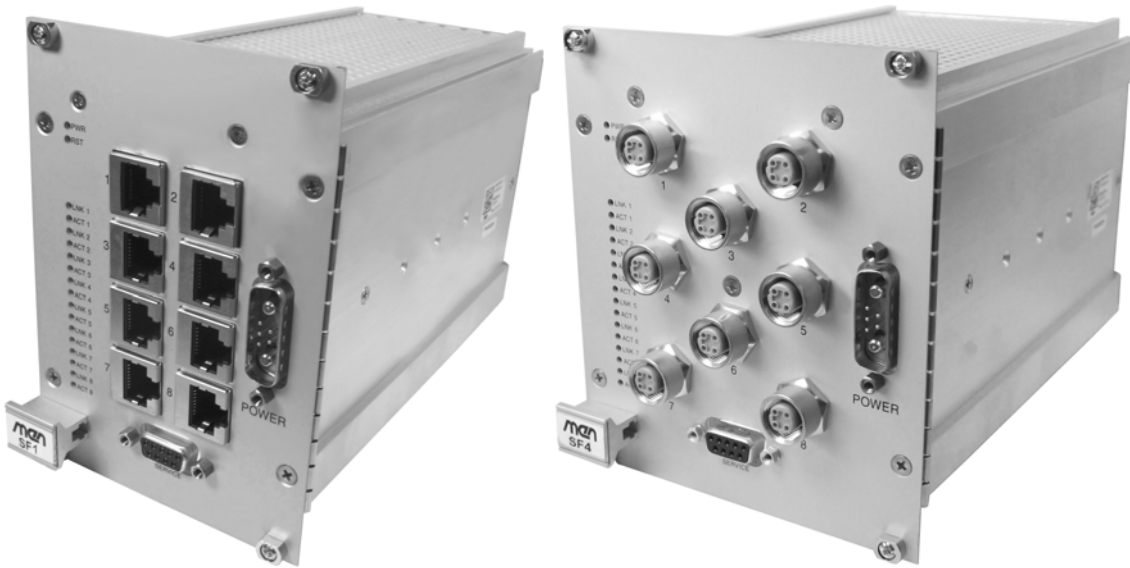


# SF1/SF4 – 3U Unmanaged 8-Port Ethernet Switches



Configuration examples

User Manual

## **SF1/SF4 – 3U Unmanaged 8-Port Ethernet Switches**

The SF1/SF4 is a stand-alone, unmanaged Fast Ethernet switch that comes in a compact 3U 19" cassette. It provides eight channels at the front panel accessible through RJ45 or M12 connectors.

It is supplied by its integrated, rugged power supply unit (PSU), with a power connector at the front panel. The entire switch consumes less than 7 W and needs no cooling.

The switch supports full-duplex and half-duplex operation with auto-negotiation, high-speed non-blocking store-and-forward-switching, Quality of Service (QoS) support with four traffic classes IEEE 802.1p and three-level 802.1x security. The switch is fault tolerant and restores itself on its own: If a link is temporarily unavailable, frames can be sent via backup/redundant links (spanning tree protocol / link aggregation) and no data loss occurs. Its built-in test mechanisms make the switch an even more reliable component in the communication system.

In addition, the switch can act as Power over Ethernet (PoE) Power Sourcing Equipment (PSE), supplying devices connected to ports 1 and 2 with power.

By using an application-specific configuration EEPROM, the SF1/SF4 can act similarly to a managed switch with fixed settings. This enables features untypical for unmanaged models like 802.1p priority and port based priority, port based VLAN or IEEE 802.1q VLAN IDs. Additionally, a service port is accessible at the front panel on an M12 connector, enabling authorized personnel to configure the switch via an SPI interface.

The SF1/SF4 was specifically designed for rugged mobile communication systems. It is thus for example fully compliant with the EN 50155 railway standard. All components inside the cassette are specified for a -40 to +85°C operation temperature. There are no socketed components, hardening the box against shock and vibration. Its PCBs are ready for coating (standard for the SF4) and the switch has a guaranteed minimum standard availability of 5 years.

# Technical Data

## **Switch Fabric Key Features**

- Eight 10/100Base-T ports at front panel
  - Electrical isolation: 1500Vrms
- Auto-negotiation
- High-speed non-blocking, store-and-forward switching
- 8K MAC address lookup table with automatic learning and aging
- Layer 2 switching
- Back pressure or IEEE802.3x flow control
- Automatic MDI/MDI-X crossover (all ports)
- TCP/IP (IPv4, IPv6)

## **Layer 2 Features**

- Transparent bridging
- QoS (DiffServ) and 802.1p traffic prioritization queuing, polishing, shaping
- VLAN-aware bridging

## **Security Features**

- MAC based and IP based access list (ACL) for traffic filtering
- Rate-limiting and storm control to prevent packet flooding from malicious peers

## **Supported Ethernet Standards**

- Transparent bridging: IEEE 802.1D, 2004
- VLAN: IEEE 802.1Q Rev D5.0, 2005
- Port based VLANs: IEEE 802.1Q Rev D5.0, 2005
- Link aggregation: IEEE 802.3ad, 2005
- Priority based switching: IEEE 802.1p
- Power over Ethernet support: IEEE 802.1af

## **Power Over Ethernet Features**

- Power over Ethernet functions on ports 1 and 2
  - PSE (Power Sourcing Equipment) function
- Supplies one PD class 0 device or two PD class 2 devices (up to 15W total)

## **Service Interface**

- 9-pin D-Sub connector at front
- SPI interface for external SPI programmer

---

### Front I/O

- 8 Ethernet ports via RJ45 (SF1) or M12 connectors (SF4)
- 1 service interface via 9-pin D-Sub plug connector
- 1 power input via mixed 7-pin D-Sub plug connector
- 16 link and activity Ethernet status LEDs (2 per channel)
- 4 Power over Ethernet status LEDs, 2 each for ports 1 and 2
- Status LEDs for power and reset

---

### Electrical Specifications

- Power supply unit
  - 14.4V..154V DC wide range according to EN50155
- Isolation (according to EN50155)
  - Input/output: 1500Vrms
  - Input/shield: 1500Vrms (7W2 D-Sub power connector: 1000 Vrms)
  - Output/shield: 1500Vrms
  - Ground/shield: 1500Vrms
- Power consumption: tbd. W
- MTBF: Approx. 200,000h @ 40°C according to IEC/TR 62380 (RDF 2000)

---

### Mechanical Specifications

- 19" rack-mount standard
- Front protected according to IP20
- Dimensions: 3U, 18HP (SF1) or 22HP (SF4), 168mm depth
- Weight: ca. 870g (SF1) / 970g (SF4)

---

### Environmental Specifications

- Temperature range (operation):
  - -40..+85°C (qualified components)
- Temperature range (storage): -40..+85°C
- Relative humidity (operation): max. 95% non-condensing
- Relative humidity (storage): max. 95% non-condensing
- Altitude: -300m to + 3,000m
- Shock: according to EN60068-2-27
- Bump: according to EN60068-2-29
- Vibration (sinusoidal): according to EN60068-2-6
- Conformal coating on request (standard for SF4)

---

### Safety

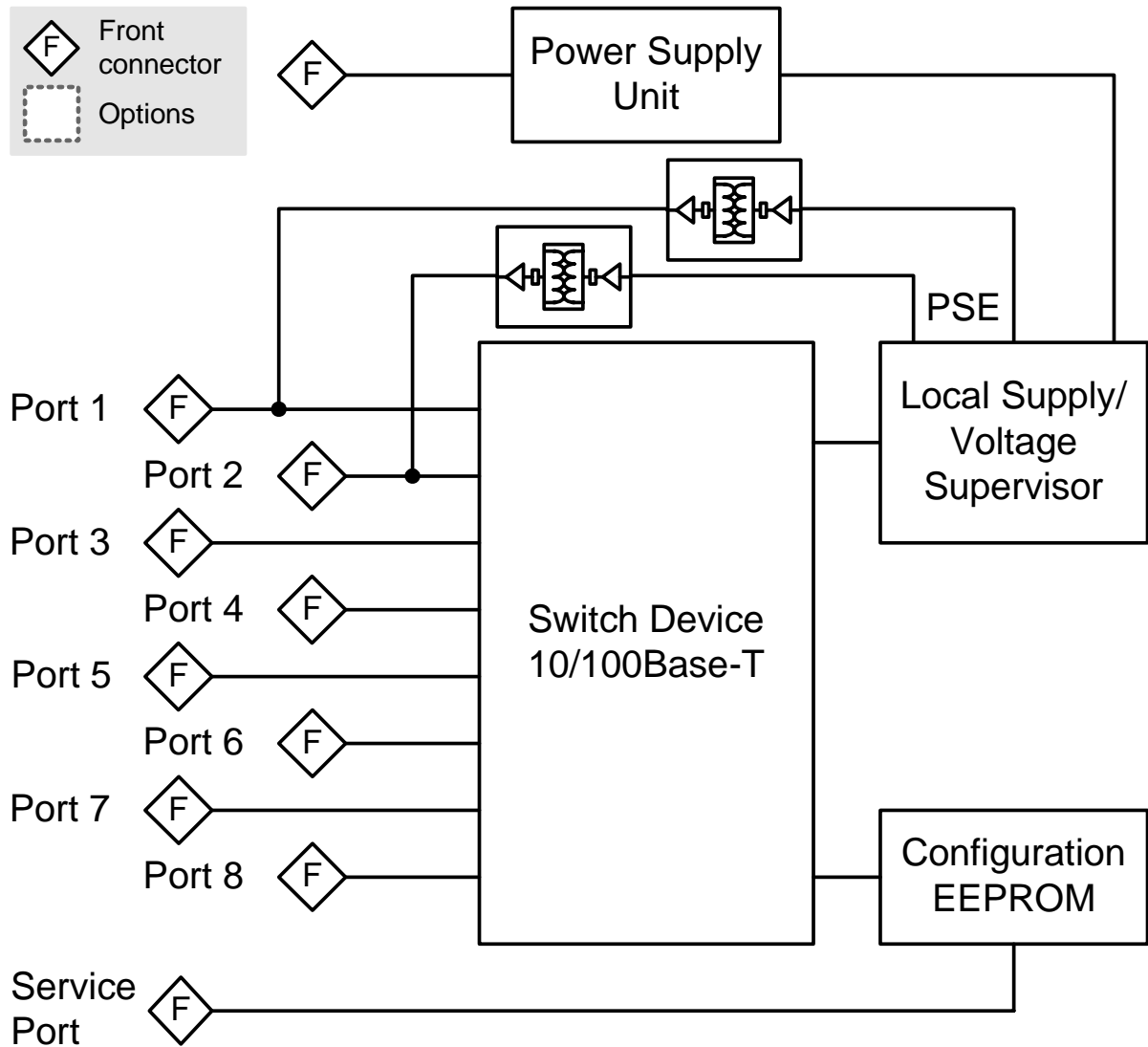
- PCBs manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

---

### EMC

- Tested according to EN55022 (radio disturbance), EN61000-4-2 (ESD), EN61000-4-4 (burst) and EN61000-4-5 (surge)

## Block Diagram



## Configuration Options

### ***Front Connectors / Mechanical***

- RJ45 (SF1)
- M12 (SF4)

### ***Ethernet Switch***

- Fixed managed version
  - With fixed configuration according to customer requirements

### ***Ethernet-powered version without PSU (on request)***

- Class 2 Powered Device supplied via Ethernet Port 1
  - No internal power supply unit

### ***Environmental Specifications***

- Conformal coating for SF1 (on request, standard for SF4 model)

**Please note that some of these options may only be available for large volumes.  
Please ask our sales staff for more information.**

**For available standard configurations see:**



**[SF1 online data sheet.](#)**

**[SF4 online data sheet.](#)**

## Product Safety



### Electrostatic Discharge (ESD)

Computer boards and components contain electrostatic sensitive devices. Electrostatic discharge (ESD) can damage components. To protect the switch and other components against damage from static electricity, you should follow some precautions whenever you work on your computer.

- Power down and unplug your computer system when working on the inside.
- Hold components by the edges and try not to touch the IC chips, leads, or circuitry.
- Use a grounded wrist strap before handling computer components.
- Place components on a grounded antistatic pad or on the bag that came with the component whenever the components are separated from the system.
- Store the switch only in its original ESD-protected packaging. Retain the original packaging in case you need to return the unit to MEN for repair.

## About this Document

This user manual describes the hardware functions of the unit, connection of peripheral devices and integration into a system. It also provides additional information for special applications and configurations of the unit.

The manual does not include detailed information on individual components (data sheets etc.). A list of literature is given in the appendix.

### History

Issue	Comments	Date of Issue
E1	First issue	2009-02-16
E2	Corrected pin assignment of power supply connector Major general update based on new hardware and firmware specification	2010-02-15

### Conventions



This sign marks important notes or warnings concerning proper functionality of the product described in this document. You should read them in any case.

*italics*

Folder, file and function names are printed in *italics*.

**bold**

**Bold** type is used for emphasis.

monospace

A monospaced font type is used for hexadecimal numbers, listings, C function descriptions or wherever appropriate. Hexadecimal numbers are preceded by "0x".

hyperlink

Hyperlinks are printed in [blue color](#).



The globe will show you where [hyperlinks](#) lead directly to the Internet, so you can look for the latest information online.

IRQ#  
/IRQ

Signal names followed by "#" or preceded by a slash ("/") indicate that this signal is either active low or that it becomes active at a falling edge.

in/out

Signal directions in signal mnemonics tables generally refer to the corresponding board or component, "in" meaning "to the board or component", "out" meaning "coming from it".

Vertical lines on the outer margin signal technical changes to the previous issue of the document.



## Legal Information

MEN Mikro Elektronik reserves the right to make changes without further notice to any products herein. MEN makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does MEN assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages.

"Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts.

MEN does not convey any license under its patent rights nor the rights of others.

Unless agreed otherwise, MEN products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the MEN product could create a situation where personal injury or death may occur. Should Buyer purchase or use MEN products for any such unintended or unauthorized application, Buyer shall indemnify and hold MEN and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that MEN was negligent regarding the design or manufacture of the part.

Unless agreed otherwise, the products of MEN Mikro Elektronik are not suited for use in nuclear reactors and for application in medical appliances used for therapeutic purposes. Application of MEN products in such plants is only possible after the user has precisely specified the operation environment and after MEN Mikro Elektronik has consequently adapted and released the product.

ESM™, MDIS™, MDIS4™, MENMON™, M-Module™, M-Modules™, SA-Adapter™, SA-Adapters™, UBox™ and USM™ are trademarks of MEN Mikro Elektronik GmbH. PC-MIP® is a registered trademark of MEN Micro, Inc. and SBS Technologies, Inc. MEN Mikro Elektronik®, ESMexpress® and the MEN logo are registered trademarks of MEN Mikro Elektronik GmbH.

All other products or services mentioned in this publication are identified by the trademarks, service marks, or product names as designated by the companies who market those products. The trademarks and registered trademarks are held by the companies producing them. Inquiries concerning such trademarks should be made directly to those companies. All other brand or product names are trademarks or registered trademarks of their respective holders.

Information in this document has been carefully checked and is believed to be accurate as of the date of publication; however, no responsibility is assumed for inaccuracies. MEN Mikro Elektronik accepts no liability for consequential or incidental damages arising from the use of its products and reserves the right to make changes on the products herein without notice to improve reliability, function or design. MEN Mikro Elektronik does not assume any liability arising out of the application or use of the products described in this document.

Copyright © 2010 MEN Mikro Elektronik GmbH. All rights reserved.



Please recycle

### Germany

MEN Mikro Elektronik GmbH  
Neuwieder Straße 5-7  
90411 Nuremberg  
Phone +49-911-99 33 5-0  
Fax +49-911-99 33 5-901  
E-mail [info@men.de](mailto:info@men.de)  
[www.men.de](http://www.men.de)

### France

MEN Mikro Elektronik SA  
18, rue René Cassin  
ZA de la Châtelaine  
74240 Gaillard  
Phone +33 (0) 450-955-312  
Fax +33 (0) 450-955-211  
E-mail [info@men-france.fr](mailto:info@men-france.fr)  
[www.men-france.fr](http://www.men-france.fr)

### USA

MEN Micro, Inc.  
24 North Main Street  
Ambler, PA 19002  
Phone (215) 542-9575  
Fax (215) 542-9577  
E-mail [sales@menmicro.com](mailto:sales@menmicro.com)  
[www.menmicro.com](http://www.menmicro.com)

# Contents

<b>1</b>	<b>Getting Started .....</b>	<b>13</b>
1.1	Front Panels .....	13
1.2	Mounting the Switch .....	14
1.3	Starting Up the Switch. ....	14
<b>2</b>	<b>Functional Description .....</b>	<b>15</b>
2.1	Power Supply .....	15
2.2	Ethernet Interface .....	16
2.2.1	Ethernet Switch .....	17
2.2.2	Configuration of the Switch .....	17
2.2.3	Power over Ethernet .....	18
2.3	Service Interface (SPI) .....	18
2.4	Front Panel Status LEDs .....	19
2.4.1	General Status LEDs .....	19
2.4.2	Power over Ethernet Status LEDs .....	19
2.4.3	Ethernet Port Status LEDs .....	20
<b>3</b>	<b>Appendix .....</b>	<b>21</b>
3.1	Literature and Web Resources .....	21
3.2	Finding out the Board's Article Number, Revision and Serial Number	21

---

## Figures

Figure 1. Front panels .....	13
Figure 2. Labels giving the board's article number, revision and serial number.	21

---

## Tables

Table 1.	Pin assignment of the power supply 7W2 D-Sub connector . . . . .	15
Table 2.	Input voltage detection coding . . . . .	15
Table 3.	Signal mnemonics of Ethernet 10/100Base-T connectors . . . . .	16
Table 4.	Pin assignment of 8-pin RJ45 Ethernet 10/100Base-T connectors (SF1). . . . .	16
Table 5.	Pin assignment of 4-pin M12 Ethernet 10/100Base-T connectors (SF4). . . . .	16
Table 6.	Default switch configuration at startup . . . . .	17
Table 7.	Pin assignment of the 9-pin D-Sub service interface connector. . . . .	18
Table 8.	Front-panel status LEDs . . . . .	19
Table 9.	General status LEDs . . . . .	19
Table 10.	Power over Ethernet status LEDs. . . . .	19
Table 11.	Ethernet port status LEDs. . . . .	20

# 1 Getting Started

This chapter gives an overview of the switch and some hints for first installation in a system.

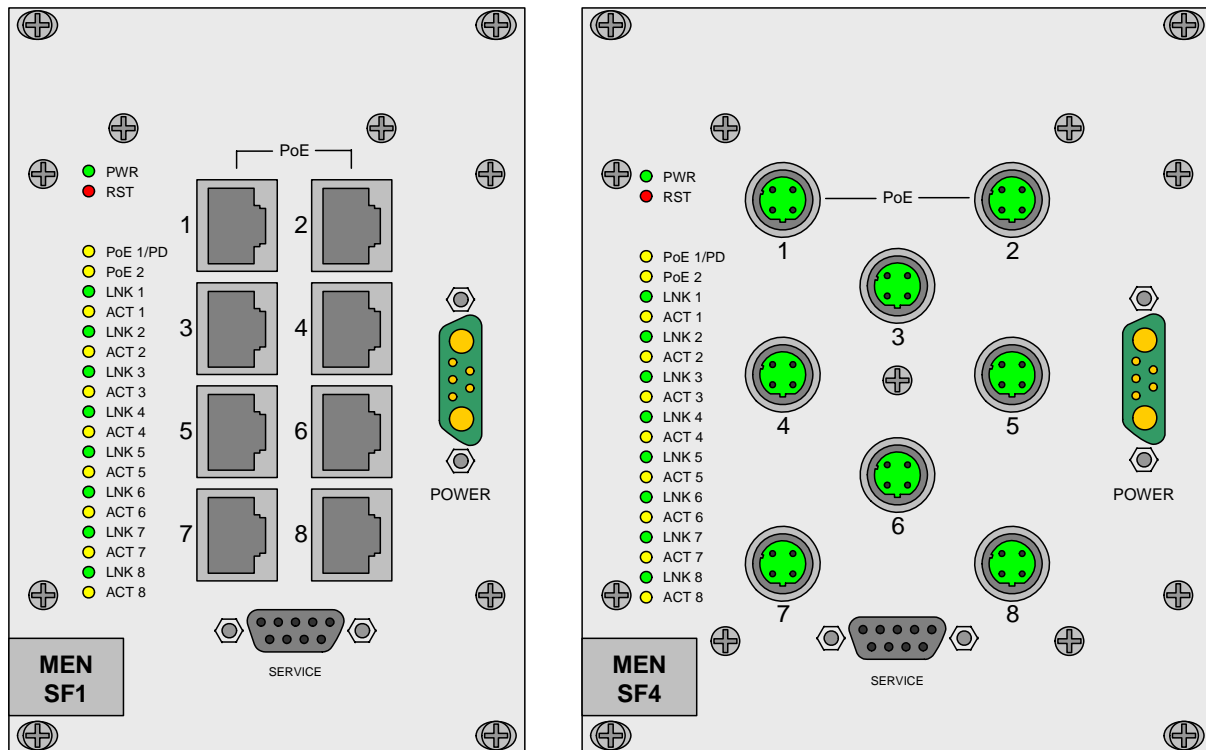
## 1.1 Front Panels

The front panel is the only technical difference between the SF1 and the SF4. It affects the type of connectors available and thus the width of the entire unit:

- 8 RJ45 connectors on an 18HP front panel (SF1)
- 8 M12 connectors on a 22HP front panel (SF4)

All I/O is located on the front panel.

**Figure 1.** Front panels



## **1.2 Mounting the Switch**

The SF1/SF4 can be used as a stand-alone unit or integrated into a standard 19" rack. In the latter case, make sure to secure the unit by fastening the four screws in the top left/right and bottom left/right corners of the front panel.

## **1.3 Starting Up the Switch**

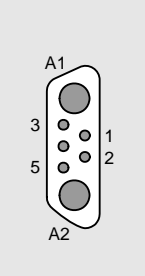
After connecting all Ethernet devices to be served by the switch, simply connect a suitable power source (with respective input voltage coding, see [Chapter 2.1 Power Supply](#)) and the switch will boot up with its default settings (see [Chapter 2.2.2 Configuration of the Switch](#)). An "Ethernet Switch Quick Start Guide" covering the setup process and troubleshooting will be made available separately by MEN.

## 2 Functional Description

### 2.1 Power Supply

The unit is supplied with 14.4..154 V DC via a mixed 7W2 D-Sub connector.

**Table 1.** Pin assignment of the power supply 7W2 D-Sub connector

	A1	Analog ground
	1	Input voltage coding BAT0
	2	Input voltage coding BAT1
	3	-
	4	-
	5	-
	A2	Input voltage

The nominal power supply input voltage is set by applying voltage as shown in the table below. This way the unit can be made compliant to different voltage standards.

**Table 2.** Input voltage detection coding

Nominal voltage	Input voltage code		Power-On Threshold	Power-Off Threshold
	Connect BAT0 to:	Connect BAT1 to:		
24/36 V	Analog ground	Analog ground	16.8 V	14.64 V
48 V	Analog ground	Input voltage	33.6 V	29.28 V
72/96/110 V	Input voltage	Analog ground	50.4 V	43.92 V

## 2.2 Ethernet Interface

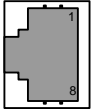
**Table 3.** Signal mnemonics of Ethernet 10/100Base-T connectors

Signal	Direction	Function
RX+/-	in	Differential pair of receive data lines for 10/100Base-T
TX+/-	out	Differential pair of transmit data lines for 10/100Base-T

Connector types for SF1:

- Modular 8/8-pin mounting jack according to FCC68
- Mating connector:  
Modular 8/8-pin plug according to FCC68

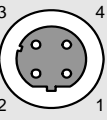
**Table 4.** Pin assignment of 8-pin RJ45 Ethernet 10/100Base-T connectors (SF1)

	1	RX+
	2	RX-
	3	TX+
	4	-
	5	-
	6	TX-
	7	-
	8	-

Connector types for SF4:

- 4-pin circular M12 receptacle
- Mating connector: 4-pin circular M12 plug

**Table 5.** Pin assignment of 4-pin M12 Ethernet 10/100Base-T connectors (SF4)

	1	TX+
	2	RX+
	3	TX-
	4	RX-





### 2.2.1 Ethernet Switch

The SF1/SF4 uses a manageable 8-port 10/100Base-T switch component, the Marvell 88E6095. The switch provides 10/100 Mb/s configuration possibility on each port.

It is also possible to configure each port in half-duplex or full-duplex.

The device characteristics are:

- 8 external ports configurable as 10/100 Mb/s
- MII interface
- Each external port is configurable in half-duplex or full-duplex mode
- Non-blocking wire speed switching
- Store-and-forward mode
- Auto negotiation
- Port mirroring
- Port monitoring
- Flow control
- VLAN support
- Port based frame prioritization
- Automatic MDI/MDI-X crossover (all ports)
- Configuration by EEPROM

### 2.2.2 Configuration of the Switch

The SF1/SF4 loads the following standard configuration for all ports at startup:

**Table 6.** Default switch configuration at startup

Setting	Default
Duplex mode	Full Duplex
Port speed	Auto-Negotiate
VLAN (port-based)	Off
QoS (Quality of Service)	Off
Port mirroring and port monitoring	Off
Port trunking	Off
Power over Ethernet functionality (Ports 1 & 2)	PSE functionality enabled

By using a customer-specific configuration EEPROM, the SF1/SF4 can act similarly to a managed switch with fixed settings. Please [contact MEN](#) if you need a switch with a non-standard configuration.

### 2.2.3 Power over Ethernet

Ports 1 and 2 of the SF1/SF4 support Power over Ethernet according to IEEE802.3af. Both of those ports support PSE (power sourcing equipment) functionality.



The SF1/SF4 can deliver power to devices of all PD classes. Please note however that the combined power level drawn by connected PDs must not exceed 15 W!

As an option, the SF1/SF4 can also support PD (powered device) functionality on port 1 to supply the switch with power drawn from a PSE (power sourcing equipment) device. Such SF1/SF4 units act like a class 2 PD. They cannot work as PSE devices.

### 2.3 Service Interface (SPI)

The service connector features an interface for an external SPI programmer for maintenance purposes. It is to be used by authorized personnel only. Please [contact MEN](#) if you need a switch with a non-standard configuration.









**Table 7.** Pin assignment of the 9-pin D-Sub service interface connector

	Pin	Name	Description
	1	SPI_CLK	SPI clock
	2	SPI_MOSI	SPI data in
	3	SPI_MISO	SPI data out
	4	-	Not used
	5	GND	Ground
	6	SPI_CS	SPI chip select
	7	+3.3V	Power supply
	8	-	Not used
	9	GND	Ground

## 2.4 Front Panel Status LEDs



The SF1/SF4 has a number of status LEDs at its front panel.

**Table 8.** Front-panel status LEDs

LED	Description
 <b>PWR</b>	General Power Good
 <b>RST</b>	Reset
 <b>LNK 1</b>	Port 1 link
 <b>ACT 1</b>	Port 1 activity
 <b>LNK 2</b>	Port 2 link
 <b>ACT 2</b>	Port 2 activity
...	...
 <b>LNK 8</b>	Port 8 link
 <b>ACT 8</b>	Port 8 activity

### 2.4.1 General Status LEDs



**Table 9.** General status LEDs

LED	Description
 <b>PWR</b>	On: Switch is powered on
 <b>RST</b>	On: Reset signal is active

### 2.4.2 Power over Ethernet Status LEDs

The function of the PoE LED of port 1 changes depending on whether the PSE or the PD mode of the switch is enabled.



**Table 10.** Power over Ethernet status LEDs

LED	With switch in PSE mode	With switch in PD mode
 <b>POE 1/PD</b>	On: Power is transmitted to the PD connected to port 1.	On: Switch is correctly supplied with power by the PSE connected to port 1.
 <b>POE 2</b>	On: Power is transmitted to the PD connected to port 2.	No function - PSE function of port 2 is disabled in PD mode.

### 2.4.3 Ethernet Port Status LEDs

Each Ethernet user port (1 to 8) provides two LEDs to display its status (*LNK x* and *ACT x*). The display LEDs act as described in the following table.

**Table 11.** Ethernet port status LEDs

LED	Description
 <b>LNK x</b>	On: Link up
 <b>ACT x</b>	On: Transmit or receive activity

An alternative LED configuration with one LED indicating link status and receive activity and the other indicating transmit activity can be realized on demand.

## 3 Appendix



### 3.1 Literature and Web Resources

- SF1 data sheet with up-to-date information and documentation:  
<http://www.men.de/products/19SF01-.html>
- SF4 data sheet with up-to-date information and documentation:  
<http://www.men.de/products/19SF04-.html>

### 3.2 Finding out the Board's Article Number, Revision and Serial Number

MEN user documentation may describe several different models and/or hardware revisions of the SF1/SF4. You can find information on the article number, the board revision and the serial number on two labels attached to the board.

- **Article number:** Gives the board's family and model. This is also MEN's ordering number. To be complete it must have 9 characters.
- **Revision number:** Gives the hardware revision of the board.
- **Serial number:** Unique identification assigned during production.

If you need support, you should communicate these numbers to MEN.

**Figure 2.** Labels giving the board's article number, revision and serial number

